

EXHIBIT D

pipe instead of the existing 60-inch diameter pipe, or a 75% reduction in culvert's opening area. The below table shows a comparison of the partially blocked culvert with 2016 condition at UPRR Culvert 1.57 Hearne Subdivision.

Flood Frequency	WSE (ft); Unobstructed Culvert	WSE (ft); Culvert 75% Blocked	Δ WSE (ft)
50-year	429.29	433.21	+3.92
100-year	430.42	434.62	+4.20
500-year	433.72	438.29	+4.57

It is noted that even if the culvert's opening area is 75% clogged, the drainage capacity of the culvert will still be larger than the 500-year runoff event without overtopping the track's base of rail elevation of 441.5. Additionally, as noted on Table 4 (Page 10) of the Civil Engineering Expert report prepared by Givler Engineering, Inc., dated June 28, 2018, the surveyed High Water Mark associated with this event is at elevation 432.5. It is noted that based on Olsson's hydraulic modeling and evaluation shown above, this elevation is closer to the unobstructed culvert performance for the 500-year event than it is for a 75% blocked culvert.

Conclusions

From the above discussion, the following conclusions are formulated:

- Peak flows (and volumes) of runoff are significantly higher than when the UPRR culvert was constructed, due to urban development within the culvert's drainage area. In fact, peak flows have increased by 50% when compared to historical condition, resulting in corresponding increase in water surface elevations.
- Since the urban development did not incorporate detention/retention facilities to regulate downstream flows to the levels of pre-development, it is UPRR's track embankment and culvert acting as quasi-dam metering (regulating) flows downstream of the track embankment and providing flood protection to downstream areas.
- As described herewith, the 29/30 April 2016 storm event was on the order of a 500-year event, and due to the high antecedent moisture condition the resulting runoff was larger than the 500-year event which is considered an "Act of God" and exceeds design criteria used for major infrastructure drainage facilities. **In our opinion the culvert was likely unobstructed (free of debris) or slightly obstructed with the computed 500-year water surface elevation consistent with highwater marks observed and surveyed during the site visit/survey and verified with Givler Engineering, Inc.'s survey.**

Please let us know if you have any questions or need additional information.

Attachments: Figure 1 (NWS Ft Worth 29 and 30 April 2016 Precipitation Distribution)
 Sheet 1 (Aerial Location Map)
 Sheet 2 (Culvert Replacement Location Survey)
 Sheet 3 (USGS Drainage Area Map)
 Sheet 4 (FEMA Flood Insurance Rate Map)
 Culvert 1.57: Hearne Sub Site Photolog